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**Datasheet for the decision
of 12 July 2017**

Case Number: T 0397/15 - 3.3.03
Application Number: 06006576.0
Publication Number: 1707581
IPC: C08F220/04, C08F220/28,
C08F2/38, C04B24/26, C04B24/28
Language of the proceedings: EN

Title of invention:

Polycarboxylic acid polymer for blending in cement

Patent Proprietor:

NIPPON SHOKUBAI CO., LTD.

Opponent:

BASF SE

Relevant legal provisions:

EPC Art. 123(2), 56

Keyword:

Amendments - Main request, Auxiliary requests 1a and 1b -
allowable (no)
Inventive step - Auxiliary requests 2, 2a, 2b, 3, 3a, 3b, 4,
4a, 4b, 5, 5a, 5b, 6, 6a, 6b, 7, 7a, 7b, 8, 8a, 8b, 9, 9a, 9b,
10, 10a and 10b - (no)



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Case Number: T 0397/15 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 12 July 2017

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 23 December
2014 revoking European patent No. 1707581
pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman D. Semino
Members: D. Marquis
R. Cramer

Summary of Facts and Submissions

- I. The appeal lies from the decision of the Opposition Division posted on 23 December 2014 revoking European patent No. 1 707 581.
- II. A notice of opposition was filed in which revocation of the patent in its entirety was requested.
- III. Documents D3 (EP1304314), D12 (EP1103570), D13 (US20020193547) and D14 (WO02096823) *inter alia* were cited during opposition proceedings.
- IV. The decision of the opposition division was based on a main request filed with letter of 17 January 2012, on auxiliary request 1 filed with letter of 24 September 2014 and on auxiliary requests 2 to 7 filed during the oral proceedings before the opposition division on 24 November 2014.

Claims 1 and 9 of the main request read:

"1. A polycarboxylic acid polymer for a cement admixture, characterized in that

(1) a molecular weight distribution of the polycarboxylic acid polymer is determined by gel permeation chromatography to provide a molecular-weight distribution curve having an elution time on the horizontal axis,

(2) a base line is drawn on the molecular-weight distribution curve,

(3) an elution-starting time, an elution-ending time, and a peak-top time of a peak corresponding to the polymer component are determined respectively as L_h , L_n , and M_p ,

(4) L_m is calculated according to the following Formula (1):

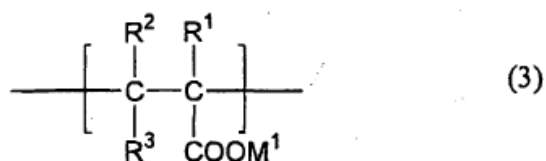
$$L_m = (L_n + M_p) / 2 \quad (1),$$

and

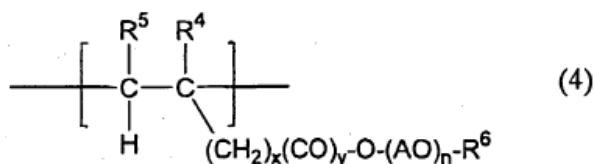
(5) P_0 and Q_0 satisfy the following Formula (2):

$$15 \leq (P_0 \times 100) / (P_0 + Q_0) \leq 45 \quad (2)$$

wherein P_0 is defined as a peak area between the elution times L_m and L_n and Q_0 is defined as the peak area between the elution times L_h and M_p , wherein the polymer contains a constituent unit (I) in an amount of 2 wt% to 90 wt%, represented by the following Chemical Formula (3)

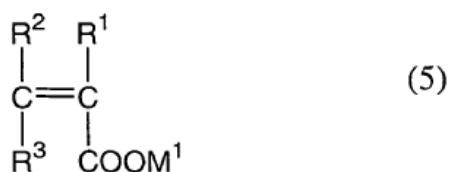


[wherein, R^1 , R^2 and R^3 each independently represent a hydrogen atom, a methyl group, or $-(CH_2)_zCOOM^2$ [$-(CH_2)_zCOOM^2$ may form an anhydride with $-COOM^1$ or another $-(CH_2)_zCOOM^2$]; Z represents an integer of 0 to 2; and M^1 and M^2 each independently represent a hydrogen atom, an alkali metal atom, an alkali-earth metal atom, an ammonium group or an organic amine group], and wherein the polymer contains a constituent unit (II) in an amount of 2 wt% to 98 wt%, represented by the following Chemical Formula (4):



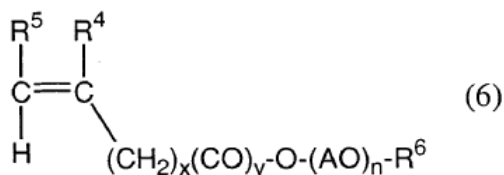
[wherein, R⁴ and R⁵ each independently represent a hydrogen atom or a methyl group; each AO independently represents an oxyalkylene group having 2 or more carbon atoms or a mixture of two or more thereof; x represents an integer of 0 to 2; y is 0 or 1; n represents an average oxyalkylene-group-addition mole number of 1 to 300; and R⁶ represents a hydrogen atom or a hydrocarbon group having 1 to 20 carbon atoms]."

"9. A method of producing a polycarboxylic acid polymer for a cement admixture, comprising polymerizing an unsaturated monomer component containing a monomer represented by the following Chemical Formula (5):



[wherein, R¹, R² and R³ each independently represent a hydrogen atom, a methyl group, or -(CH₂)_zCOOM² [-(CH₂)_zCOOM² may form an anhydride with -COOM¹ or another -(CH₂)_zCOOM²]; Z represents an integer of 0 to 2; and M¹ and M² each independently represent a hydrogen atom, an alkali metal atom, an alkali-earth metal atom, an ammonium group or an organic amine group] in two steps where the amounts of a chain-transfer agent with respect to the unsaturated monomer components are different from each other, wherein the amounts of the chain-transfer agent used with respect to the unsaturated monomer components are different from each other by 5 times or more between polymerization steps constituting the two steps, wherein the amounts of the chain-transfer agent is 0.1 mol % to 10 mol % in the first step and 3 mol % to

30 mol % in the second step with respect to the mole number of the monomer components in mole percent, wherein the volume of an aqueous monomer-mixture solution containing the unsaturated monomer components and relatively small amount of the chain-transfer agent added in the first step is larger than the volume of an aqueous monomer-mixture solution containing the unsaturated monomer components and relatively large amount of the chain-transfer agent added in the second step, and wherein the unsaturated monomer component contains a monomer represented by the following Chemical Formula (6):



[wherein, R⁴ and R⁵ each independently represent a hydrogen atom or a methyl group; each AO independently represents an oxyalkylene group having 2 or more carbon atoms or a mixture of two or more thereof (when two or more oxyalkylene groups are used, the oxyalkylene groups may be added in a block form or random form); x represents a number of 0 to 2; y is 0 or 1; n represents an average oxyalkylene-group-addition mole number of 1 to 300; and R⁶ represents a hydrogen atom or a hydrocarbon group having 1 to 20 carbon atoms]."

Claim 9 of auxiliary request 1 differed from claim 9 of the main request in that the amounts of the chain-transfer agent used with respect to the unsaturated monomer components are different from each other "by 5.5 times or more", in that the feature relating to volume of the aqueous monomer-mixture solution was deleted from the claim and in that it was added that

"the polycarboxylic acid polymer has a peak-top molecular weight of 20,000 or more, as determined by gel permeation chromatography". Auxiliary request 2 did not include method claim 9 and its claim 1 was identical to claim 1 of the main request. Claim 1 of auxiliary request 3 differed from claim 1 of the main request in that it was added that "(6) the polycarboxylic acid polymer has a peak-top molecular weight of 20,000 or more". Claim 1 of auxiliary request 4 corresponded to claim 1 of the main request, while claim 1 of auxiliary requests 5 and 6 corresponded to claim 1 of auxiliary request 3. In claim 1 of auxiliary request 7, the minimum value of the range relating to Formula (2) was raised to 20, the minimum value of the open range relating to the peak-top molecular weight of polycarboxylic acid polymer was raised to 35,000 and "wherein the gel permeation chromatography (GPC) is measured as described in the description under the heading (GPC measurement)".

- V. The decision of the opposition division, as far as relevant to the present decision, can be summarised as follows:

Claim 9 of the main request did not fulfill the requirements of Article 123(2) EPC because the limitation of the volumes of aqueous monomer mixture solution in each of the two steps of the claimed method was not disclosed as such in the application as filed. Moreover, it did not meet the requirements of Article 84 EPC in view of the contradiction between the conditions on the amounts of chain-transfer agent in the two steps and on their ratio. Claim 9 of auxiliary request 1 lacked clarity of the same reason. Claim 1 of auxiliary request 2 lacked novelty over several prior art documents and was not sufficiently disclosed. Claim

1 of auxiliary request 3 was also not sufficiently disclosed. Auxiliary requests 4 to 6 were not allowable because claim 1 of these requests corresponded to claim 1 of auxiliary requests 2 and 3, which had been shown not to fulfill the requirements of the EPC. Claim 1 of auxiliary request 7 lacked clarity in view of the reference to the description and its subject matter was not sufficiently disclosed for the same reasons as that of auxiliary request 2.

VI. The proprietor (appellant) lodged an appeal against that decision. With the statement setting out the grounds of appeal, the appellant filed a main request as well as auxiliary requests 1a, 1b, 2, 2a, 2b, 3, 3a, 3b, 4, 4a, 4b, 5, 5a, 5b, 6, 6a, 6b, 7, 7a, 7b, 8, 8a, 8b, 9, 9a and 9b.

The main request submitted in appeal corresponded to the main request decided upon by the opposition division.

Claim 1 of auxiliary requests 2, 3 and 4 corresponded to claim 1 of the main request.

Claim 1 of auxiliary request 5 corresponded to claim 1 of the main request reformulated as a cement admixture comprising a polycarboxylic acid polymer defined as in the main request and "wherein the cement admixture does not further comprise a second polycarboxylic acid polymer that is different from the polycarboxylic acid polymer".

Claim 1 of auxiliary request 6 corresponded to claim 1 of the main request further characterized in that "(6) the polycarboxylic acid polymer has a peak-top molecular weight of 30,000 to 100,000".

Claim 1 of auxiliary request 7 corresponded to claim 1 of auxiliary request 5 further characterized in that "(6) the polycarboxylic acid polymer has a peak-top molecular weight of 30,000 to 100,000".

Claim 1 of auxiliary request 8 corresponded to claim 1 of the main request to which the minimum value of Formula (2) was amended from "15" to "18".

Claim 1 of auxiliary request 9 corresponded to claim 1 of auxiliary request 5 in which the minimum value of Formula (2) was amended from "15" to "18".

In claim 1 of the auxiliary requests 1a, 2a, 3a, 4a, 5a, 6a, 7a, 8a and 9a, the specification "wherein the gel permeation chromatography (GPC) is measured as described in the description under the heading (GPC measurement)" was added to the formulation of claim 1 of the main request or auxiliary requests 2 to 9 respectively.

In claim 1 of the auxiliary requests 1b, 2b, 3b, 4b, 5b, 6b, 7b, 8b and 9b, the full description of the GPC method found on page 56, line 3 to page 58, line 1 of the description as originally filed was added to the formulation of claim 1 of the main request or auxiliary requests 2 to 9 respectively.

VII. In the reply to the statement of grounds of appeal, the respondent (opponent) contested inter alia claim 9 of the main request in view of Article 123(2) EPC and considered that claim 1 of all requests lacked an inventive step. The following documents were also filed by the respondent therewith:

Attachment 1: Brochure from Tosoh Bioscience

Attachment 2: "Flächenbestimmung", Meyers dictionary

Attachment 3: Table 1, comparison of structure and properties of the polymers according to the patent in suit and D14

Attachment 4: Experimental report filed with letter of 15 September 2015

D15: EP1300426

VIII. With letter of 2 August 2016, the appellant filed new auxiliary requests 10, 10a and 10b.

Claim 1 of auxiliary request 10 corresponded to claim 1 of auxiliary request 6 to which the minimum value of Formula (2) was amended from "15" to "20" and y was limited to "1" only.

In claim 1 of the auxiliary request 10a, the specification "wherein the gel permeation chromatography (GPC) is measured as described in the description under the heading (GPC measurement)" was added to the formulation of claim 1 of auxiliary requests 10.

In claim 1 of the auxiliary request 10b, the full description of the GPC method found on page 56, line 3 to page 58, line 1 of the description as originally filed was added to the formulation of claim 1 of auxiliary requests 10.

IX. In a communication sent in preparation of oral proceedings, the Board summarised the points to be dealt with and provided a preliminary view on the disputed issues.

X. Oral proceedings were held on 12 July 2017.

XI. The arguments provided by the appellant, as far as relevant to the present decision, can be summarised as follows:

Admittance of documents and requests

D15 as well as attachments 1-4 were late filed. As these documents could have been filed earlier into the proceedings, they should not be admitted in appeal.

The auxiliary requests 10, 10a and 10b were filed in reply to the additional experiments 12-21 contained in the attachment 4 submitted with the reply to the statement of grounds of appeal. These request should be admitted into the proceedings.

The decision of the opposition division to admit the late filed documents D12 to D14 into the proceedings was incorrect. These documents should not be part of the appeal proceedings.

Main request, auxiliary requests 1a and 1b

Amendments - Claim 9

Even if the wording relating to the volume of the aqueous monomer solution in claim 9 of the main request was not literally present in the documents of the application as originally filed, it could be nevertheless derived therefrom when read as a whole. Formula (2) defining the polymer of the patent in suit implied that the parameter Q_0 had to be larger than P_0 . From the description (paragraph 38 of the patent) as well as Table 1 showing the results of the examples taken in combination with Figure 1 of the opposed patent, it was apparent for a person skilled in the art

that the volume of solution (I) needed to be larger than that the solution (II). Claim 9 therefore met the requirements of Article 123(2) EPC.

Claim 9 of the auxiliary requests 1a and 1b, which was based on claim 9 of the main request was also made dependent on claim 1. That amendment overcame the objection raised under Article 123(2) EPC.

Auxiliary requests 2, 2a, 2b, 3, 3a, 3b, 4, 4a, 4b, 5, 5a, 5b, 6, 6a, 6b, 7, 7a, 7b, 8, 8a, 8b, 9, 9a, 9b, 10, 10a and 10b

Inventive step - Claim 1

The claimed subject matter differed from the closest prior art D3 in that the claimed polycarboxylic acid polymers fulfilled the condition set out in Formula (2) of claim 1. The effect of that difference was to retain the good dispersibility of the composition over a long period of time (good water flow after 30 minutes), as shown by the examples of the patent in suit. The solution proposed in the patent in suit was to strike a favourable balance between low and high molecular weight components in the composition by putting an emphasis on the low molecular weight component. The flow values illustrating the dispersibility properties of the claimed compositions disclosed in the examples of the patent in suit could not be directly compared with those disclosed in D3 since different methods were used for their measurements. Besides, D3 taught away from the solution provided in the patent in suit since D3 aimed at increasing the high molecular weight components in the composition by charging the chain transfer agent into the polymerization reactor before addition of the first monomer solution. The

inventive step objection raised in view of D3 as closest prior art was therefore based on an ex-post facto analysis of the claimed subject matter. In view of the fact that the subject matter of claim 1 of auxiliary request 2 was inventive over D3. The same arguments applied in view of auxiliary requests 2a, 2b, 3, 3a, 3b, 4, 4a, 4b, 5, 5a, 5b, 6, 6a, 6b, 7, 7a, 7b, 8, 8a, 8b, 9, 9a, 9b, 10, 10a and 10b.

XII. The arguments of the respondent, as far as relevant to the present decision, can be summarised as follows:

Admittance of documents and requests

D15 and the attachments 1-4 were filed in response to the amendments made by the appellant in some of the auxiliary requests first filed with the statement of grounds of appeal. These documents should be admitted into the proceedings.

The auxiliary requests 10,10a and 10b were late filed and were not filed in reaction of a new argument or fact introduced in the proceedings. These requests should not be admitted into the proceedings.

D12 to D14 were already in the proceedings and they did not add any complexity to the case.

Main request, auxiliary requests 1a and 1b

Amendments - Claim 9

The application as originally filed did not provide a basis for the feature relating to the volumes of the solutions (I) and (II) defined in method claim 9. That feature was not even mentioned in the documents as

filed. Claim 9 contravened Article 123(2) EPC.

Since claim 9 of auxiliary requests 1a and 1b was essentially the same as claim 9 of the main request, the same arguments and the same conclusion applied to these requests.

Auxiliary requests 2, 2a, 2b, 3, 3a, 3b, 4, 4a, 4b, 5, 5a, 5b, 6, 6a, 6b, 7, 7a, 7b, 8, 8a, 8b, 9, 9a, 9b, 10, 10a and 10b

Inventive step - Claim 1

Both D3 and the patent in suit aimed at cement compositions having a good dispersibility as well as a good dispersibility retention over time. D3 was the closest prior art. The examples of the patent in suit did not establish the presence of an improvement over the compositions of D3. The patent in suit taught that an increase of the ratio of chain transfer agent to monomers by a factor of more than five in the second polymerization step was related to the dispersibility properties of the cement compositions. The referential examples 2 and 3 of D3 also disclosed an increased ratio of more than 5 (5.9 in referential example 2 and 5.27 in referential example 6) in the course of a two step polymerization. As to formula (2) as defined in the patent in suit, it represented the balance of high to low molecular weight components in the composition. The claimed range only meant that the composition contained more high molecular weight component than low molecular weight component. The values defining that range were arbitrary and so fulfilling the condition set out in claim 1 of auxiliary request 2 only required routine experimentation in view of D3. The patent in suit thus did not provide any contribution that was not

already known from D3. Therefore, claim 1 of the auxiliary request 2 lacked an inventive step. These arguments and conclusions also applied to claim 1 of auxiliary requests 2a, 2b, 3, 3a, 3b, 4, 4a, 4b, 5, 5a, 5b, 6, 6a, 6b, 7, 7a, 7b, 8, 8a, 8b, 9, 9a, 9b, 10, 10a and 10b.

XIII. The appellant requested that the decision under appeal be set aside and the patent be maintained on the basis of the main request or on the basis of one of auxiliary requests 1a, 1b, 2, 2a, 2b, 3, 3a, 3b, 4, 4a, 4b, 5, 5a, 5b, 6, 6a, 6b, 7, 7a, 7b, 8, 8a, 8b, 9, 9a or 9b filed with the statement of grounds of appeal, or on the basis of one of auxiliary requests 10, 10a or 10b filed with the letter of 2 August 2016.

XIV. The respondent requested that the appeal be dismissed.

Reasons for the Decision

Admittance of documents and requests

1.1 The main request as well as all auxiliary requests filed with the statement of grounds of appeal are in the proceedings according to Article 12(1) and (2) RPBA. As they were not objected to by the respondent, the Board sees no reason to make use of its power under Article 12(4) RPBA.

1.2 Document D15 and attachments 1-4 filed by the respondent with the reply to the statement of grounds to complement the objections and data in opposition are seen by the Board as a legitimate reaction to the many requests in the proceedings. In view of this, the Board sees no reason to make use of its power under

Article 12(4) RPBA and the documents are in the proceedings.

1.3 Auxiliary requests 10, 10a and 10b were filed in the response of the appellant to the reply of the statement of grounds. As they were filed well in advance of the summons to oral proceedings, they can be seen as a reaction to the new submissions of the respondent. Also, these requests mainly introduce a combination of features already present in the previous requests, so that they do not add complexity to the case. The Board finds it appropriate to exercise its discretion under Article 13(1) RPBA by admitting auxiliary requests 10, 10a and 10b into the proceedings.

1.4 As to documents D12 to D14, which were admitted by the opposition division and analysed as to their content in the reasons of the decision, the Board sees no legal basis to overturn the decision of the opposition division.

Main request and auxiliary requests 1a and 1b

2. Amendments - Claim 9

2.1 In the assessment of compliance with Article 123(2) EPC, amendments can only be made within the limits of what a skilled person would derive directly and unambiguously, using common general knowledge, from the application as originally filed. With regard to the decision of the opposition division, the question that had to be answered was whether the application as filed disclosed a method of producing a polycarboxylic acid polymer for a cement admixture according to claim 9 of the main request that was a two steps method "wherein the volume of an aqueous monomer-mixture solution

containing the unsaturated monomer components and relatively small amount of the chain-transfer agent added in the first step is larger than the volume of an aqueous monomer-mixture solution containing the unsaturated monomer components and relatively large amount of the chain-transfer agent added in the second step".

2.2 It was not disputed that the application as originally filed did not disclose that feature explicitly. Indeed, the volume of aqueous monomer-mixture solutions involved in the polymerization process is neither mentioned in the description nor in claim 16 of the application as originally filed upon which claim 9 of the main request was based.

2.3 The appellant asserted that the contested feature added in claim 9 was apparent from paragraph 38 of the patent in suit and from the examples taken in combination with figure 1 when considering that the area Q_0 corresponding to the high molecular weight components had to be larger than the area P_0 corresponding to the low molecular weight components. The passage on page 22, lines 1-20 of the application as originally filed, which corresponds to paragraph 38 of the patent in suit, describes a method of producing polycarboxylic acid polymers and provides a generic definition of the monomers used in the two step polymerization process. That passage concerns the amount in chain transfer agent and does not pertain to aqueous monomer mixture solutions, nor their respective volumes. Also, the appellant did not show how the contested feature could be directly and unambiguously derived from the cited passage. Under these circumstances, the Board finds that the passage cited by the appellant does not constitute an appropriate basis for the contested

feature.

2.4 The appellant also argued that the contested feature of claim 9 ensued from the fact that both conditions relating to formula (2) and to the amount in chain transfer agent had to be satisfied. The appellant did however not show how the above mentioned volumes could be deduced from these two conditions unambiguously. There is no information to that effect in the patent in suit and no documentation reflecting the common general knowledge thereupon was made available to the Board. Under these circumstances, it cannot be concluded that the contested feature of claim 9 can be derived directly and unambiguously, using common general knowledge, from the application as originally filed. For these reasons, claim 9 of the main request does not meet the requirements of Article 123(2) EPC.

2.5 Since claim 9 of auxiliary requests 1a and 1b only differs from claim 9 of the main request in that a reference to claim 1 has been added, which amendment has no bearing on the objection under Article 123(2) EPC decided for the main request, the conclusion arrived at in the case of the main request applies equally to auxiliary requests 1a and 1b.

Auxiliary requests 2, 2a, 2b, 3, 3a, 3b, 4, 4a, 4b, 5, 5a, 5b, 6, 6a, 6b, 7, 7a, 7b, 8, 8a, 8b, 9, 9a, 9b, 10, 10a and 10b

3. Inventive step - Claim 1

3.1 Closest prior art

3.1.1 The object of the patent in suit is to provide a polycarboxylic acid polymer for a cement admixture having excellent dispersibility and dispersibility

retention (paragraph 6). D3 concerns a cement dispersant which is excellent in initial dispersibility and further in flow retainability of cement (paragraph 1). As D3 and the patent in suit both relate to the same issues relevant for cement compositions and no better document has been proposed by the parties, it represents the closest prior art. That has not been disputed between the parties.

3.1.2 Claim 1 of D3 discloses a cement dispersant comprising a water-soluble polymer (P) as a main component being characterized by displaying an area proportion in the range of 13 to 60% wherein the area proportion is defined by a measurement process based on gel permeation chromatography (GPC) as defined in that claim and in which the area ratio A of the higher molecular weight side portion defined as $A = (A_0 \times 100) / (A_0 + B_0)$ and the area ratio B of the lower molecular weight side portion defined as $B = (B_0 \times 100) / (A_0 + B_0)$ are such that the value $(A - B)$, given by subtracting the area ratio B of the lower molecular weight side portion from the area ratio A of the higher molecular weight side portion, is the area proportion (%).

3.1.3 Referential example 2, respectively referential example 6 of D3 more particularly concerns the preparation of polymer 1, respectively polymer 6 for producing a cement dispersant. In that preparation process, water and 3-mercaptopropionic acid as chain transfer agent were charged into a reactor and the reactor was heated to 80°C under a nitrogen atmosphere. Next, an aqueous monomer solution containing methoxypolyethylene glycol monomethacrylate having a molar-number-average degree of addition polymerization of ethylene oxide of 25 and methacrylic acid as well as

an aqueous solution of ammonium persulfate as initiator were added dropwise into the reactor. Subsequently to the end of this dropwise addition, a second aqueous monomer solution containing a higher amount of the same monomers, a chain transfer agent as well as an aqueous solution of initiator were further added into the reactor. It was undisputed between the parties that in the case of the referential examples 2 and 6 of D3, the amounts of chain transfer agent used with respect to the monomer components differed from each other by 5 times or more (referential example 2: 5.9 and referential example 6: 5.27) between these two polymerization steps. After addition of the aqueous ammonium persulfate solution, the internal temperature of the reactor was maintained at 80 °C for another 1 hour to complete the polymerization reaction. Polymer 1, respectively polymer 6, was obtained after neutralization of the reaction mixture.

- 3.1.4 Methoxypolyethylene glycol monomethacrylate having a molar-number-average degree of addition polymerization of ethylene oxide of 25 as used in the above mentioned preparation is a monomer according to formula (4) of claim 1 of auxiliary request 2. Methacrylic acid is a monomer according to formula (3) of that claim. It was also undisputed that the amounts of these monomers as disclosed in the referential examples 2 and 6 of D3 were according to claim 1 of auxiliary request 2 (2-90 wt% of monomer of formula (3) and 2-98 wt% of monomer of formula (4)).
- 3.1.5 The polycarboxylic acid polymer dispersants according to D3 and the patent in suit are further defined by area proportions of their respective molecular weight distribution curves as measured by gel permeation chromatography. The areas considered, which are related

to the low molecular weight and high molecular weight components of the composition both in D3 and in the patent in suit, have nevertheless different definitions in both documents. Under these circumstances it cannot be determined whether the polymers 2 and 6 disclosed in D3 are according to claim 1 of auxiliary request 2, i.e. whether the condition in Formula (2) is met.

3.2 Problem

3.2.1 The patent in suit contains three examples of polymers obtained according to claim 1 of auxiliary request 2 as well as two further comparative polymers. The polymers shown in the patent in suit were produced from the same monomers as in D3, albeit present in different amounts during polymerization. Also, the chain transfer agent was already present in reactor before addition of the monomer solution in D3 (see point 3.1.3 above), whereas it was only added together with the first aqueous monomer solution in the patent in suit. The amount in chain transfer agent used with respect to the monomer components of the two polymerization steps of the compositions according to the examples differed from each other by 5 times or more (Table 1; example 1: 7.24; example 2: 9.54; example 3: 9.78) in the patent in suit whereas a lower ratio was used in the case of the comparative example 1 (3.22). As to comparative example 2, it illustrates a different polymerization process wherein the polymer was obtained in one step only. In that respect, the polymers obtained in the comparative examples of the patent in suit are not according to the examples of D3 nor could be considered as representative thereof. As to the polymers according to the patent in suit, since the mortar test used to evaluate the dispersibility properties of these polymers and the mortar test used in D3 were conducted

under different conditions (polymer concentrations, amount of cement relative to amount of sand and timing of the mortar flow; paragraphs 105 and 106 of the patent in suit and paragraphs 84-88 of D3), the mortar flow values reported in these documents cannot be meaningfully compared to one another. Since the patent in suit does not contain an example of a composition according to D3 and the properties of its compositions cannot be directly compared with those disclosed in D3, the data made available do not establish the presence of an improvement of the claimed polycarboxylic acid polymers. Thus, the only problem that can be derived from the patent in suit is the provision of alternative polycarboxylic acid polymers for cement admixtures.

3.3 Obviousness

3.3.1 It remains to be determined whether the claimed subject matter was obvious to a person skilled in the art starting from the closest prior art D3 and in particular from the polymers of referential examples 2 or 6 of that document. The question posed is whether the skilled person would have expected a polycarboxylic acid polymer similar to that of referential examples 2 or 6 of D3 and such that it satisfies formula (2) of claim 1 of auxiliary request 2 to be an alternative polycarboxylic acid polymer to the composition of these examples.

3.3.2 Formula (2) is defined in claim 1 of auxiliary request 2 by "parameter P_0 " defined as $P_0 \times 100 / (P_0 + Q_0)$ and involving P_0 defined in claim 1 as a peak area between the elution times L_m and L_n , and Q_0 defined in claim 1 as the peak area between the elution times L_h and M_p . P_0 , respectively Q_0 , are seen as representing the low, respectively high, molecular weight polymer

components of the polycarboxylic acid polymers (paragraph 34). The "parameter P_0 " mentioned in claim 1 of auxiliary request 2 conveys, according to paragraph 16 of the patent in suit, the variations of the ratio of low molecular weight polymer to high molecular weight polymer in the claimed polycarboxylic acid polymer. As such, formula (2) requires the "parameter P_0 " to be between 15% and 45%. In that respect, the patent in suit teaches that a higher value of the "parameter P_0 " means an increase in the ratio of the low molecular weight polymer which would lead to an improvement of the dispersibility-retention of the cement composition (paragraph 16). By contrast, an excessively high value of the "parameter P_0 " would result in a poor dispersibility of the cement composition. The patent in suit thus teaches that having a ratio of low molecular weight polymer in the polycarboxylic acid polymer within 15-45% would be beneficial to the dispersibility of a cement composition.

3.3.3 D3 is also concerned with the molecular weight distribution of water soluble polymers (P) used as cement dispersants. The polymers of D3 are characterized by their "area proportion" determined from the molecular weight distribution curve. The area proportion is defined in claim 1 of D3 as the difference $A - B$ between the area ratios of high molecular weight portion (A) and low molecular weight portion (B) of the polymer (P) as obtained from the molecular weight distribution curve determined by gel permeation chromatography. D3 teaches (paragraph 44) that when the polymers contain more high molecular components than low molecular components to some degree, the initial dispersibility and the flow retainability of the cement produced can be high.

Specifically, the area proportion of the produced polymers is in the range of 13 to 60% in D3. In the case where the area proportion is less than 13%, high molecular components are not present in a sufficient amount such that the flow retainability of cement is inferior. In the case where the area proportion is more than 60%, the high molecular components are present in such a high amount that the initial dispersibility is inferior. D3 thus teaches that an excess ratio of high molecular weight component over the low molecular weight component within the range of 13-60% in the polycarboxylic acid polymer is beneficial to the dispersibility of a cement composition.

3.3.4 The Board concludes that the teaching of the patent in suit is in essence the same as that of D3, namely to strike a balance between high and low weight components in the polymer that is in favour of the high molecular weight components.

3.3.5 In claim 1 of auxiliary request 2, the high and low molecular weight areas Q_0 and P_0 of the molecular weight distribution curve are delimited by elution times (M_p and L_m) that are different from those used in claim 1 of D3 (M_A and M_B). It has however not been shown, nor argued by the appellant that the use of a different definition and different reference times had any influence on the dispersibility of the cement composition. Also, claim 1 of auxiliary request 2 defines in formula (2) a range (15-45%) for which no effect was shown in the patent in suit with respect to D3. The claimed range can therefore only be seen as arbitrary in view of D3 and obtainable through routine experimentation from the referential examples 2 and 6 of D3. In view of the above, the Board concludes that the subject matter of claim 1 of auxiliary request 2 is

obvious in view of D3 as the closest prior art. The requirements of Article 56 EPC are therefore not met.

- 3.4 As to the remaining auxiliary requests 2a, 2b, 3, 3a, 3b, 4, 4a, 4b, 5, 5a, 5b, 6, 6a, 6b, 7, 7a, 7b, 8, 8a, 8b, 9, 9a, 9b, 10, 10a and 10b that are in the proceedings, the parties declared that they had no further arguments regarding the question of inventive step than the arguments provided for auxiliary request 2.
- 3.4.1 Since claim 1 of auxiliary requests 3 and 4 corresponds to claim 1 of auxiliary request 2, the reasoning provided above in view of the inventive step of claim 1 of auxiliary request 2 applies equally to auxiliary requests 3 and 4.
- 3.4.2 Claim 1 of auxiliary request 5 was reformulated as a cement admixture comprising a polycarboxylic acid polymer and "wherein the cement admixture does not further comprise a second polycarboxylic acid polymer that is different from the polycarboxylic acid polymer". Since the polymers of referential examples 2 and 6 of D3 are also used in cement admixtures (examples 1 and 4, Table 2 of D3) for which no second polycarboxylic acid polymer that is different from the polycarboxylic acid polymer was added, the conclusion reached for auxiliary request 2 also applies to auxiliary request 5.
- 3.4.3 Claim 1 of auxiliary requests 6 and 7 is characterized in that "(6) the polycarboxylic acid polymer has a peak-top molecular weight of 30,000 to 100,000". It has neither been shown nor argued that limiting the peak-top molecular weight to that specific range solved a different problem than that of providing alternative

polycarboxylic acid polymers and their corresponding cement admixtures nor that the range was an unusual one. Under these circumstances, the conclusion reached for auxiliary request 2 also applies to auxiliary requests 6 and 7.

3.4.4 In claim 1 of auxiliary requests 8 and 9 the minimum value of Formula (2) was amended from "15" to "18". That limitation of the claimed range of formula (2) does not alter the reasoning provided above for auxiliary request 2 since the claimed range retains essentially the same scope. Also, it has not been shown in which respect that amendment could be seen as providing an inventive step in view of D3. Under these circumstances, the conclusion reached for auxiliary request 2 also applies to auxiliary requests 8 and 9.

3.4.5 Claim 1 of auxiliary request 10 is defined by "(6) the polycarboxylic acid polymer has a peak-top molecular weight of 30,000 to 100,000", the minimum value of Formula (2) was amended from "15" to "20" and the value of "y" in the formula defining the monomer (4) was set to 1. The monomer of D3 corresponding to the monomer (4) of the patent in suit is disclosed in paragraph 24 of D3 (Monomer (1)). From the formula provided in D3, it is immediately apparent that monomer (1) of D3 already corresponds to the monomer (4) of the patent in suit with y being 1. The examples of D3 also disclose a monomer (methoxypolyethylene glycol monomethacrylate) wherein y is 1. Thus, the amendment of y in claim 1 of auxiliary request 10 to the value 1 does not constitute a feature distinguishing the claimed subject-matter over the closest prior art D3. It has in that case again neither been shown, nor argued that limiting the peak-top molecular weight and the minimum value of Formula (2) simultaneously solved a different problem

than that of providing alternative polycarboxylic acid polymers and their corresponding cement admixtures. Under these circumstances, the conclusion reached for auxiliary requests 6 and 8 also applies to auxiliary request 10.

- 3.4.6 The modifications performed in claim 1 of the auxiliary requests 2a, 3a, 4a, 5a, 6a, 7a, 8a, 9a, 10a and 2b, 3b, 4b, 5b, 6b, 7b, 8b, 9b and 10b relate to the method of determination of the molecular weight distribution of the polymers relying on gel permeation chromatography (GPC). Claim 1 of these requests otherwise corresponds to claim 1 of auxiliary requests 2, 3, 4, 5, 6, 7, 8, 9 and 10 for which no inventive step was acknowledged. It has however not been shown nor argued that the few differences (detectors, analytic software, number of polyethylene glycol standards) between the GPC methods disclosed in the patent in suit (paragraphs 89 and 93) and in D3 (paragraphs 71-74) could in any way form the basis of an inventive step for any of the above mentioned auxiliary requests. On the contrary, it was clear for the Board and the parties that these amendments had no impact on the analysis of inventive step, but were introduced in view of the objection of lack of sufficiency. Under these circumstances, the conclusions reached for auxiliary request 2 also apply to auxiliary requests 2a, 3a, 4a, 5a, 6a, 7a, 8a, 9a, 10a and 2b, 3b, 4b, 5b, 6b, 7b, 8b, 9b and 10b.

4. Conclusion

- 4.1 As all the requests which are in the proceedings do not meet the requirements of Article 56 EPC, the appeal is to be dismissed and there is no need for the Board to decide on any other issue.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



B. ter Heijden

D. Semino

Decision electronically authenticated